

WHAT IS CLAIMED IS:

1 1. A gas concentration detecting apparatus comprising a gas concentration
2 sensor including a first cell having a solid electrolyte element and a pair of
3 electrodes disposed on said solid electrolyte element for pumping out and in
4 oxygen of a gas to be detected introduced into a chamber and a second cell having
5 a solid electrolyte element and a pair of electrodes disposed on said solid
6 electrolyte element for detecting a concentration of a specific gas component of
7 said gas after passing through said first cell, with an oxygen concentration signal
8 being outputted on the basis of a current flowing when a voltage is applied to said
9 first cell and a specific gas concentration signal being outputted on the basis of a
10 current flowing when a voltage is applied to said second cell,

11 wherein a decision on activation of said first cell and a decision on
12 activation of said second cell are separately made in the middle of activation of
13 said gas concentration sensor, and a decision indicative of the activation of said
14 second cell is made after a decision is made that the activation of said first cell
15 reaches completion.

1 2. The apparatus according to claim 1, wherein said first cell electrode
2 provided in said chamber is a specific-gas inactive electrode inactive in said
3 specific gas component, while said second cell electrode provided in the same
4 chamber is a specific-gas active electrode active in said specific gas component.

1 3. The apparatus according to claim 1, wherein said gas concentration sensor
2 further includes a third cell for detecting a residual oxygen concentration of said
3 gas after passing through said first cell so that said voltage to be applied to said
4 first cell is variably controlled on the basis of a detection result in said third cell.

1 4. The apparatus according to claim 1, further comprising an element
2 resistance detecting means for detecting a resistance value of said solid electrolyte

3 element of any one of said cells to implement control on element activation so that
4 the detected element resistance value is kept at a predetermined target value, and
5 the transition of said element resistance value detected by said element resistance
6 detecting means is monitored in the middle of the activation of said gas
7 concentration sensor, and when said element resistance value reaches an
8 activation decision value based upon said target value, a decision is made that said
9 first cell reaches its activation.

1 5. The apparatus according to claim 4, wherein, when said element resistance
2 value detected by said element resistance detecting means in the middle of the
3 activation of said gas concentration sensor reaches said activation decision value
4 and a predetermined period of time elapses after the detected element resistance
5 value reaches said activation decision value, a decision is made that said first cell
6 reaches the activation.

1 6. The apparatus according to claim 4, wherein, when said element resistance
2 value detected by said element resistance detecting means in the middle of the
3 activation of said gas concentration sensor reaches said activation decision value
4 and a detection current by said first cell falls within a predetermined range, a
5 decision is made that said first cell reaches the activation.

1 7. The apparatus according to claim 1, further comprising means for
2 implementing energizing control on a heater for the element activation so that,
3 when a predetermined period of time elapses after the start of the heater
4 energizing control in the middle of the activation of said gas concentration sensor,
5 a decision is made that said first cell reaches the activation.

1 8. The apparatus according to claim 1, wherein an elapsed time after the
2 decision is made that said first cell reaches the activation is measured and, when

3 the elapsed time reaches a predetermined time, a decision is made that said second
4 cell reaches the activation.

1 9. The apparatus according to claim 8, wherein, when an elapsed time after
2 said first cell reaches the activation reaches a predetermined time and a detection
3 current by said second cell falls within a predetermined range, a decision is made
4 that said second cell reaches activation.

1 10. The apparatus according to claim 8, further comprising a third cell for
2 detecting a residual oxygen concentration of said gas after passing through said
3 first cell so that, when an elapsed time after said first cell reaches the activation
4 reaches a predetermined time and a detection current by said third cell falls within
5 a predetermined range, a decision is made that said second cell reaches activation.

1 11. The apparatus according to claim 8, wherein said predetermined time is
2 determined on the basis of a time needed for discharging all oxygen adsorbed onto
3 a specific-gas active electrode of said second cell.